BNL Ergonomics Bulletin

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In this Issue:

What is Ergonomics?

Everyone has heard of ergonomics- after all, the word is widely used in advertisements for cars, kitchens, computers; and many other everyday objects. But to think of ergonomics simply as a way of designing things that are more comfortable to use misses the point somewhat - there is much more to it than that. So what exactly is ergonomics? The word itself is perhaps a little intimidating, but behind it lies a very simple idea.

Ergonomics is the science of fitting the jobs to the people who work in them. It is about 'fit': the fit between people, the things they do, the objects they use; and the environments in which they work, travel, and play. If the fit is good, the stresses on people are reduced. People are more comfortable, they can do things more quickly and easily, and they make fewer mistakes.

The goal of ergonomics is to reduce work related musculoskeletal disorders (MSDs) developed by workers when a major part of their jobs involve reaching, bending over, lifting heavy objects, using continuous force, working with vibrating equipment and making repetitive motions; and increase worker productivity,efficiency, and work quality.[1]

What are Musculoskeletal Disorders?

Musculoskeletal disorders (MSDs) are injuries that result from repeated strains. Individually, these strains are so minor they're virtually imperceptible. These little strains can occur in the normal course of everyday living. For example, they may occur through work, hobbies, exercise, sports, or housekeeping.

Ordinarily, the body repairs itself during time off from activity. However, if the repeated stresses aren't followed by sufficient recovery and healing time, the effect of the micro-traumas can accumulate to the point of causing pain or injury.

Musculoskeletal disorders are not new to the world of work. Some examples of common MSDs have been referred to as writer's cramp, tendonitis, and policeman's heel. Repetitive activities of professional athletes often cause them to suffer from "tennis elbow" and "pitcher's arm." The frequent use of the computer can contribute to MSDs.[2]

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How Serious of a Problem are MSDs?

Work-related musculoskeletal disorders (MSDs) result when there is a mismatch between the physical capacity of workers and the physical demands of their jobs. Each year 1.8 million workers in the United States report work-related MSDs such as carpal tunnel syndrome, tendonitis, and back injuries. About 600,000 MSDs are serious enough so that workers have to take time off to recover.[1]

Some Common MSDs:

Epicondylitis-Tennis/Golfer's Elbow:

Tennis and Golfer's elbow are painful elbow disorders. The terms are misleading because most people who have either disorder do not get it from playing tennis or golf. In fact, it seldom has any connection with fun and game.

Tennis elbow is associated with an inflammation occurring near a small point or projection of the bone in the upper arm (humerus) just above the elbow joint on the outer side of the arm. However, pain can also occur in other areas of the forearm and elbow.

Pain from tennis elbow originates mainly from injured or damaged tendons near the elbow. Onset of pain, on the outside (lateral side) of the elbow, is usually gradual with tenderness felt on, or below, the joint's bony prominence. Any repetitive motion of the forearm and elbow, such as hammering, laying bricks, or carrying a heavy load with arms extended, over a long time may lead to tennis elbow. Movements such as gripping, lifting, and carrying tend to be troublesome if one has tennis elbow.

The causes of golfer's elbow are similar to tennis elbow but pain and tenderness are felt on the inside (medial section) of the elbow, on or around the joint's bony prominence.[3]

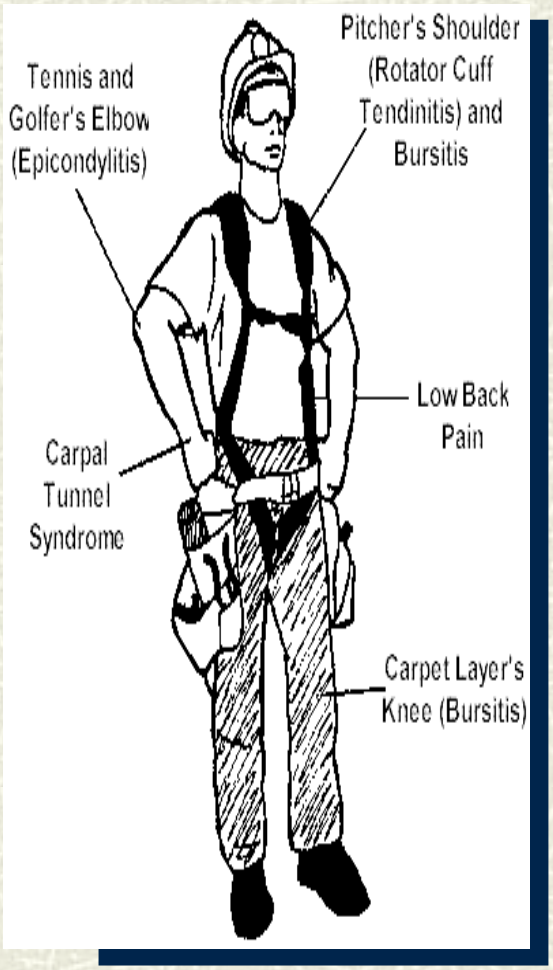

Fig.1 Locations of some common MSDs[4]

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Rotator Cuff (Shoulder) Tendonitis/Bursitis:

This is usually the result of a tendon being pinched by surrounding structures. Shoulder tendonitis/bursitis often occurs in certain sports that require the arm to move over the head repeatedly, such as in baseball, weight lifting, racket sports, and certain swimming strokes. The injury may vary from mild inflammation to involvement of most of the rotator cuff. When the rotator cuff tendon becomes inflamed and thickened, it may get trapped under the acromion (the roof, or highest point, of the shoulder that is formed by a part of the scapula, or shoulder blade). Some symptoms include pain associated with arm movement and pain in the arm at night.[2]

Low Back Pain:

A variety of activities, like lifting, lowering, pulling, or pushing heavy objects can cause pain in the lower back. Other factors may contribute to back injury/pain such as: a faulty posture, body mechanics, living or working conditions, inflexibility, body composition, and stress. If abdominal and back muscles are weak and inflexible because of poor posture or lack of use, the low back is even more susceptible to injury.

Fig.2 Inflamed Shoulder Tendons[5]

Carpet Layer's Knee Bursitis:

This is a painful inflammation of the bursa, a fluid-filled fibrous sac often found in areas subject to friction, such as around joints, or where a tendon passes over a bone. Excessive, prolonged, and repeated pressure or jolts to joints can lead to bursitis. In this case, it is caused by frequent kneeling on hard surfaces.[6]

Carpal Tunnel Syndrome (CTS):

This condition results when the median nerve in the hand does not function properly. Carpal tunnel syndrome (CTS) is a painful, debilitating condition. It involves the median nerve (depicted by arrow on Fig.3) and the flexor tendons that extend from the forearm into the hand through a "tunnel" made up of the wrist bones, or carpals, and the transverse carpal ligament.

As you move your hand and fingers, the flexor tendons rub against the sides of the tunnel. This rubbing can irritate the tendons, causing them to swell. When the tendons swell they put pressure on the median nerve. If you apply pressure on your hand/wrist, like on a sharp edge, this will also affect the median nerve. The result can be tingling, numbness, and eventually, debilitating pain (Fig.3).

CTS affects workers in many fields. It is common among draftsmen, meat cutters, secretaries, musicians, assembly-line workers, computer users, and automotive repair workers.[7]

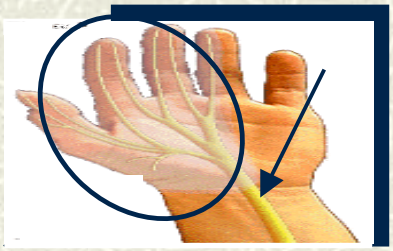

Fig.3 CTS Numbness area and Median Nerve[8]

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How to Prevent These MSDs

To prevent Epicondylitis-Tennis/Golfer's Elbow:

- Lift objects with your palm facing your body.
- Stretch relevant muscles before beginning an activity that might be stressful by grasping the top part of your fingers and gently but firmly pulling them back toward your body. Keep your arm fully extended and your palm facing outward.[3]
- Try strengthening exercises with hand weights. With your elbow locked and your palm down, repeatedly bend your wrist. Stop if you feel any pain.

To prevent Rotator Cuff (Shoulder) Tendonitis/Bursitis:

- Avoid repetitive overhead movements.
- Warm-up properly before participating in sports or other physical stress by performing stretching exercises.
- Cycle your work, recreational activities, or physical training to allow your body time to properly heal in any areas that have been stressed from physical activity. [2]

To prevent Low Back Pain:

When sitting:

- Keep your head balanced naturally over your shoulders (not protruding in front of your body).
- Keep your shoulders relaxed, not hunched.
- Keep your forearms and thighs parallel to the floor.
- Sit back in your chair for support (not on the front edge).
- Adjust the back of your chair for support.
- Settle your feet on the floor or a footrest.

When standing:

- Keep your spinal column aligned in its natural curves. What is meant by natural curves? Well, your spine looks a bit like an S from the side and that is the curve you want to keep.
    - Keep your head directly over your shoulders and your shoulders over your pelvis
    - Tighten your abdominal muscles and tuck in your bottom
    - Note: It will help if you place your feet slightly apart with one foot in front of the other and knees bent just a little bit.
- Try to stand on a soft surface (i.e. floor mat) and wear shoes with good arch supports for proper skeletal alignment and stress distribution.
- When standing for a long time, try putting one foot up on a stool/foot bar (or object of similar height) to reduce some of the stress on your lower and middle back.

Other suggestions:

- Change (shift) your posture often.
- Stretch frequently throughout the day.
- Keep your body flexible (not rigid or fixed).[9]

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To prevent Carpet Layer's Knee:

- Wear protective knee pads whenever kneeling on hard surfaces or kneel on a soft surface such as a towel or pillow.[6]

To prevent Carpal Tunnel Syndrome:

- No single mode exists to prevent carpal tunnel syndrome. However, it is important to use common sense and ergonomic controls to help minimize risk factors predisposing to work-related CTS or other cumulative trauma disorders. Exercise to strengthen the fingers, hands, wrists, forearms, shoulders, and neck may help prevent CTS.
- Avoid awkward postures and maintain a neutral posture. This posture places the least amount of stress on your joints and muscles. It also takes the strain out of your muscles and joints to allow them to work more efficiently. For example, when typing, try to maintain your wrist at a neutral posture (straight wrist). In other words as little flexion and extension as possible (Fig.4).[7]
- If your job requires repetitive hand/wrist motion, take breaks periodically.

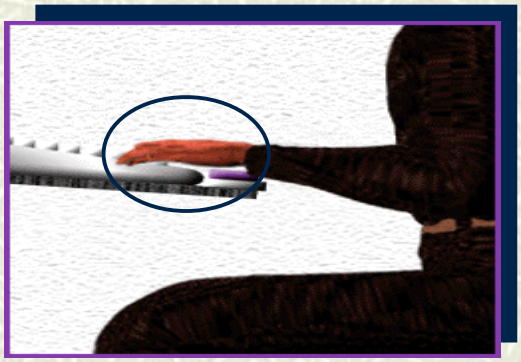

Fig 4. Neutral Hand/Wrist Posture[9]

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5. http://www.adam.com
6. http://www.cdc.gov/niosh/90-104.html
7. http://www.scoi.com/cts.html
8. http://www.3m.com/cws/selfhelp.html
9. http://www.carpal-tunnel.com/anatomy.htm

For more information on the topics discussed, check out these sites or contact the Safety and Health Services Division at Ext. 3750:

- http://beta.healthlinkusa.com/376C.asp
- http://www.3m.com/cws/selfhelp/negtilt.html
- http://www.cdc.gov
- http://www.osha.gov
- http://www.libertymutual.com

On the next issue:
Laboratory Ergonomics

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